

Remarks/Arguments:

Claims 1-21 and 23-37 are presently pending, with claims 4, 10, 17-20, 27-30, 36, and 37 withdrawn from consideration. Claims 1-3, 5-9, 11-16, 21-26, and 31-35 stand rejected. Claims 1-3, 8, 9, 16, and 35 have been amended. Claim 22 has been cancelled. Reconsideration is respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112

Page 2 of the Office Action sets forth "Claims 2, 22 and 35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement." In particular, the Office Action sets forth that "[r]e claims 2 and 35, there is no support for the claimed 'composite lens consisting of adjacently arrange plural parts of spherical lens, each center of the spherical lenses being on the line imagined by fastening the positions where light intensity is maximum in the light-emission area'... within the figures of elected species of figure 4A and 4B." Applicants herein amend claims 2 and 35 to remove this feature.

The Office Action further sets forth "[r]e claims 2 and 35, there is no support for the claimed... 'or a composite lens consisting of adjacently arranged plural parts of spherical lens and plural parts of cylindrical lens'... within the figures of elected species of figure 4A and 4B." Applicants respectfully disagree. As illustrated in FIG. 4B, composite lens 30 includes plural spherical lens parts 43, 44, 45, and 46 and plural cylindrical lens parts 48, 50, and 52. The plural lens parts are arranged adjacently to each other. See the application at paragraphs [0029]-[0031], and FIG. 4B. Accordingly, Applicants respectfully submit that the above claimed feature has support within the figures of elected species of FIGS. 4A and 4B.

Finally, the Office Action sets forth "[r]e claim 22, there is no support for the claimed 'wherein each opening of the opening array consists of three micro circular openings which are located at the vertexes of a triangle'... within the figures of elected species of figure 4A, 4B and 13A-G." Applicants herein cancel claim 22.

For the above reasons, Applicants respectfully request that this rejection be withdrawn.

Claim Rejections Under 35 U.S.C. §§ 102 & 103

Claim 1

Page 3 of the Office Action sets forth "Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Chiu et al. (U.S. PGPub 2001/0010449; hereinafter 'Chiu')." Page 4 of the Office Action sets forth "Claim[]1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (U.S. 6,888,171; hereinafter 'Liu') in view of Chiu." Applicants respectfully request reconsideration of these rejections for the reasons below.

Applicants' invention, as recited by claim 1, includes features which are neither disclosed nor suggested by the cited art, namely:

...a light-emitting element having a light-emitting area... the light-emitting area having a shape including a plurality of line segments and one or more intersections of line segments...and...

...a lens...

...wherein the lens comprises a cylindrical portion disposed on each of the line segments of the light-emitting area and a spherical portion disposed on each of the one or more intersections of line segments of the light-emitting area.

Basis for this amendment may be found in the original application at paragraphs [0027]-[0031] and FIGS. 4A and 4B. No new matter is added.

Liu is directed to a light emitting diode. As illustrated in FIG. 1, Liu discloses an LED including a U-shaped p-window region 101 and p-contact layer 102 for transmitting light. See Liu at column 1, line 59 to column 2, line 41; and FIGS. 1 and 2.

Chiu is directed to a high-efficiency white light emitting diode. As illustrated in FIG. 3, Chiu discloses an LED chip 300 having a transparent substrate 302 formed on its upper light-emitting surface 322. An anti-reflective layer 326 is formed on the surface 328 of the transparent substrate 302. The LED chip 300 and transparent substrate 302 are covered by a fluorescent paste 320. See Chiu at paragraphs [0021]-[0024]; and FIG. 3.

Liu and Chiu individually and in combination fail to disclose, teach, or suggest a lens comprising a cylindrical portion and a spherical portion. This is different from the claimed invention, which requires a lens having a cylindrical portion disposed on a line segment of the

light-emitting area and a spherical portion disposed on an intersection of line segments of the light-emitting area.

Accordingly, Applicants respectfully submit that Liu and Chiu, either individually or in combination, fail to disclose, teach, or suggest "a light-emitting area... having a shape including a plurality of line segments and one or more intersections of line segments... and a lens... wherein the lens comprises a cylindrical portion disposed on each of the line segments of the light-emitting area and a spherical portion disposed on each of the one or more intersections of line segments of the light-emitting area," as recited in claim 1.

It is because Applicants' claimed includes the cylindrical lens portion disposed on a line segment of the light-emitting area and the spherical lens portion disposed on an intersection of line segments of the light-emitting area that the following advantages are achieved. "By using such composite lens formed so as to correspond with the approximately U-shaped light-emitting area, the light ray may be refracted toward a light axis direction, i.e., toward a rod lens array in each portion of the approximately U-shaped light-emitting area. As a result, the directivity of the Lambertian emitted light may be narrowed as shown in FIG. 5." See the application at paragraph [0031].

Accordingly, for the reasons set forth above, claim 1 is allowable over the cited art. Withdrawal of the rejection and allowance of claim 1 is respectfully requested.

Claims 2, 3, 5-9, 11-15

Page 5 of the Office Action sets forth "Claims 2, 3, 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu modified by Chiu... further in view of Bohn (U.S. 6,188,527) and Mesquida (U.S. 4,703,219)." Page 7 of the Office Action sets forth "Claims 8, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu in view of Bohn." Page 9 of the Office Action sets forth "Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu... further in view of Bohn." Page 10 of the Office Action sets forth "Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu modified by Bohn... further in view of Tanioka et al. (U.S. 6,002,420; hereinafter 'Tanioka')." Applicants respectfully request reconsideration of these rejections for the reasons below.

Claim 8, while not identical to claim 1, includes features similar to the allowable features of claim 1 set forth above. Claims 2, 3, 5-7, 9, and 11-15 each depend from one of claims 1 and 8. Applicants respectfully submit that the additions of Bohn, Mesquida and Tanioka fail to make up for the deficiencies of Liu and Chiu with respect to claim 1.

Bohn is directed to an LED array formed with an optical adhesive. As illustrated in FIG. 4A, Bohn discloses a spherical lens 41 formed on an LED. As illustrated in FIG. 4B, Bohn discloses a cylindrical lens 42 formed on an LED. See Bohn at column 4, lines 23-36; and FIGS. 4A and 4B. Bohn fails to disclose, teach, or suggest a lens comprising a cylindrical portion and a spherical portion.

Mesquida is directed to an optical device for concentrating the light from an LED. As illustrated in FIG. 3, Mesquida discloses an LED having circular emissive sections 21-25. Mesquida discloses spherical lenses 91-95 formed around the circular emissive sections 21-25. Additionally, as illustrated in FIG. 4, Mesquida discloses an LED having linear emissive sections 15-18. Mesquida discloses cylindrical lenses 11-14 formed around the linear emissive sections 15-18. See Mesquida at column 4, lines 30-52; column 5, lines 13-51; and FIGS. 3 and 4. Mesquida fails to disclose, teach, or suggest a lens comprising a cylindrical portion and a spherical portion.

Tanioka is directed to an image recording apparatus. Tanioka fails to disclose any lens.

Accordingly, Applicants respectfully submit that Liu, Chiu, Bohn, Mesquida, and Tanioka, either individually or in combination, fail to disclose, teach, or suggest "a light-emitting area... having a shape including a plurality of line segments and one or more intersections of line segments... and a lens... wherein the lens comprises a cylindrical portion disposed on each of the line segments of the light-emitting area and a spherical portion disposed on each of the one or more intersections of line segments of the light-emitting area," as recited in claim 1.

As set forth above, claim 8 includes features similar to the allowable features of claim 1 set forth above. Accordingly claim 8 is allowable over the cited art for at least the reasons set forth above with respect to claim 1. Withdrawal of the rejection and allowance of claim 8 is respectfully requested.

As set forth above, claims 2, 3, 5-7, 9, and 11-15 each depend from one of claims 1 and 8. Accordingly, claims 2, 3, 5-7, 9, and 11-15 are also allowable over the cited art for at least

the reasons set forth above with respect to claim 1. Withdrawal of the rejection and allowance of claims 2, 3, 5-7, 9, and 11-15 is respectfully requested.

Claims 16, 21-26, and 31-35

Page 10 of the Office Action sets forth "Claims 16, 22, 24, 26, 31, 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins et al. (U.S. 5,711,890; hereinafter 'Hawkins') in view of Bohn." Page 13 of the Office Action sets forth "Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn... further in view of Mesquida." Page 14 of the Office Action sets forth "Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn... further in view of Scifres et al. (U.S. 3,954,534; hereinafter 'Scifres')." Page 15 of the Office Action sets forth "Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn... further in view of Beauvais et al. (U.S. 6,514,877; hereinafter 'Beauvais')." Page 15 of the Office Action further sets forth "Claims 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn... further in view of Tanioka." Applicants respectfully request reconsideration of these rejections for the reasons below.

Applicants' invention, as recited by claim 16, includes features which are neither disclosed nor suggested by the cited art, namely:

- ...(b) preparing a glass substrate...
- ...(c) forming a etching stopper film on the glass substrate...
- ...(d) forming an opening array in the etching stopper film...
- ...(e) forming an array of recesses in the glass substrate under the opening array by wet etching, each recess having a shape including a plurality of line segments and one or more intersections of line segments, each recess including a cylindrical concavity disposed on each of the line segments of the recess and a spherical concavity disposed on each of the one or more intersections of line segments of the recess....

Basis for this amendment may be found in the original application at paragraphs [0055]-[0057] and FIGS. 4A, 4B, and 13. No new matter is added.

As set forth above, Bohn, Mesquida, and Tanioka, either individually or in combination, all fail to disclose, teach, or suggest a lens including both spherical portions and cylindrical

portions. Applicants respectfully submit that the additions of Hawkins, Scifres, and Beauvais fail to make up for the deficiencies of Bohn, Mesquida, and Tanioka.

Hawkins is directed to a method for forming cylindrical lens arrays. As illustrated in FIGS. 4A-4C, Hawkins discloses forming an etch-stop layer 110 on an inorganic support layer 100. Hawkins further discloses subjecting the support layer 100 to a substantially isotropic etch to provide depressions 120. See Hawkins at column 5, lines 33-63; and FIGS. 4A-4C. Hawkins fails to disclose, teach, or suggest forming depressions 120 having both cylindrical and spherical portions.

Scifres is directed to a method of forming a light emitting diode array. As illustrated in FIG. 1, Scifres discloses an array of light emitting diodes 1 disposed on a support substrate 2. Support substrate 2 includes a number of hemispherical depressions. See Scifres at column 2, lines 52-66; and FIG. 1. Scifres fails to disclose, teach, or suggest support substrate 2 including depressions having both cylindrical and spherical portions.

Beauvais is directed to a method for fabricating masks for UV lithography. Beauvais fails to disclose any process for forming an array of recesses.

Accordingly, Applicants respectfully submit that Hawkins, Scifres, and Beauvais, either individually or in combination with Bohn, Mesquida, and Tanioka, fail to disclose, teach, or suggest "forming an array of recesses in the glass substrate under the opening array by wet etching, each recess having a shape including a plurality of line segments and one or more intersections of line segments, each recess including a cylindrical concavity disposed on each of the line segments of the recess and a spherical concavity disposed on each of the one or more intersections of line segments of the recess," as recited in claim 16.

It is because Applicants' claimed includes forming an array of recesses having a shape including a plurality of line segments and one or more intersections of line segments, each recess including a cylindrical concavity disposed on each of the line segments of the recess and a spherical concavity disposed on each of the one or more intersections of line segments of the recess, that the following advantages are achieved. "Therefore, the recess shape corresponding to the shape of the composite lens shown in FIGS. 4A and 4B is formed." See the application at paragraph [0057]. "By using such composite lens formed so as to correspond with the approximately U-shaped light-emitting area, the light ray may be refracted toward a light axis

direction, i.e., toward a rod lens array in each portion of the approximately U-shaped light-emitting area. As a result, the directivity of the Lambertian emitted light may be narrowed as shown in FIG. 5." See the application at paragraph [0031].

Accordingly, for the reasons set forth above, claim 16 is allowable over the cited art. Withdrawal of the rejection and allowance of claim 1 is respectfully requested.

Claims 21-26 and 31-35 each depend from claim 16. Accordingly, claims 21-26 and 31-35 are also allowable over the cited art for at least the reasons set forth above with respect to claim 16. Withdrawal of the rejection and allowance of claims 21-26 and 31-35 is respectfully requested.

Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Notification of such effect is earnestly solicited.

Respectfully submitted,



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